A taxonomic revision of the genus *Byblis* (Byblidaceae) in northern Australia

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Abstract

Lowrie, A. and Conran, J.G. A taxonomic revision of the genus *Byblis* (Byblidaceae) in northern Australia. Nuytsia 12(1): 59-74 (1998). The northern Australian species of *Byblis* (Byblidaceae) are revised and illustrated. Two new species, *Byblis aquatica* Lowrie & Conran and *B. rorida* Lowrie & Conran are named. *Byblis liniflora* subsp. *occidentalis* Conran & Lowrie is reduced to a synonym of *B. filifolia* Planch., which is reinstated as a distinct species. Lectotypifications are provided for *B. filifolia* and *B. liniflora* Salisb. A key, table and distribution maps for the four *Byblis* taxa in northern Australia are also presented.

Introduction

When *Byblis liniflora* subsp. *occidentalis* was described (Conran & Lowrie 1993), the existence of a third taxon, referred to by the manuscript name *B.* aff. *liniflora* "Darwin", was recorded. This taxon was considered to be an ecotype of *B. liniflora*, growing in wetter conditions than *B. liniflora,* and it was elected to retain *B.* aff. *liniflora* "Darwin" within *B. liniflora* pending further studies. Meyers-Rice (1993) demonstrated that two taxa, *B.* aff. *liniflora* "Kununurra" (*B. filifolia*) and *B.* aff. *liniflora* "Darwin" (*B. aquatica*) were reproductively isolated and Flísek (1996) concluded that *B.* aff. *liniflora* "Darwin" was sufficiently distinct on morphological grounds to be regarded as a distinct species.

The aim of the current study was to revise the taxonomy of the genus *Byblis* Salisb. (Byblidaceae) in northern Australia by means of a re-examination of the type material and a detailed examination of the morphology and ecology of all members of the plant group.

Materials and methods

Extensive field studies of the northern *Byblis* taxa were conducted by Allen and Pauline Lowrie in the Kimberley in northern Western Australia and the Northern Territory from 1988 to 1996. Field-collected seeds of *B. aquatica* (*A. Lowrie* 10, 74, 891, 897, 932, 1117); *B. filifolia* (*A. Lowrie* 722, 771, 1110, 1399, 1410, 1463); *B. liniflora* (*A. Lowrie* 951, 1107, 1389, 1413, 1416, 1462); and *B. rorida*

(*A. Lowrie* 1394, 1405, *A. Lowrie & S. Geisen s.n.* 10 Feb. 1995, *R. L. Barrett* 250, 617, 825) were grown in an unheated glasshouse in Perth during the summer from 1989 to 1996.

The early collections of *Byblis aquatica, B. filifolia* and *B. liniflora* were cultivated annually from the previous season's hand-pollinated seed. In 1996, *B. rorida* was cultivated for the first time with *B. aquatica, B. filifolia* and *B. liniflora* under identical conditions.

Seed was germinated by first soaking the seed in a solution of 10 ml of gibberellic acid to 1000 ml of distilled water for 24 hours. Seed was surface sown onto sphagnum peat moss in 15 cm diam. plastic pots. The pots were watered from below by standing them in a tray holding a 2 cm depth of water. Natural sunlight was provided broken by 30% shade cloth.

Morphological descriptions were drawn up using dried, spirit, fresh and cultivated material. The illustrations were drawn from fresh material.

Taxonomic treatment

Table 1 compares the morphological characteristics of the four species of *Byblis* in northern Australia. Figure 1 provides a generalized geographical distribution for these species.

Table 1. Morphological comparison of the four species of *Byblis* in northern Australia

	B. aquatica	*B. filifolia*	*B. liniflora*	*B. rorida*
Plants				
height	up to 5 cm [1]	20-60 cm	5-15 cm	6-30 cm
Sepals				
length	3-4 mm	4.5-6.5 mm	3-5.5 mm	3.5-4.5 mm
stalked glands	short	short	short	long
sessile glands	absent	absent	absent	present
Corolla				
adaxial surface	purple	mauve	pinkish mauve	mauve
abaxial surface	purple	white, yellow or yellow with mauve stripes	white	white
Anthers				
length	< filaments	> filaments	< filaments	> filaments
Seeds				
length	1-1.3 mm	0.5-0.6 mm	0.6-0.8 mm	0.7-0.8 mm
longitudinal ridges	smooth, prominent	denticulate	minutely denticulate crenulate	minutely denticulate,
transverse ridges	absent	deep	shallow	shallow

[1] stems becoming much longer (up to 45 cm) but then straggling or floating

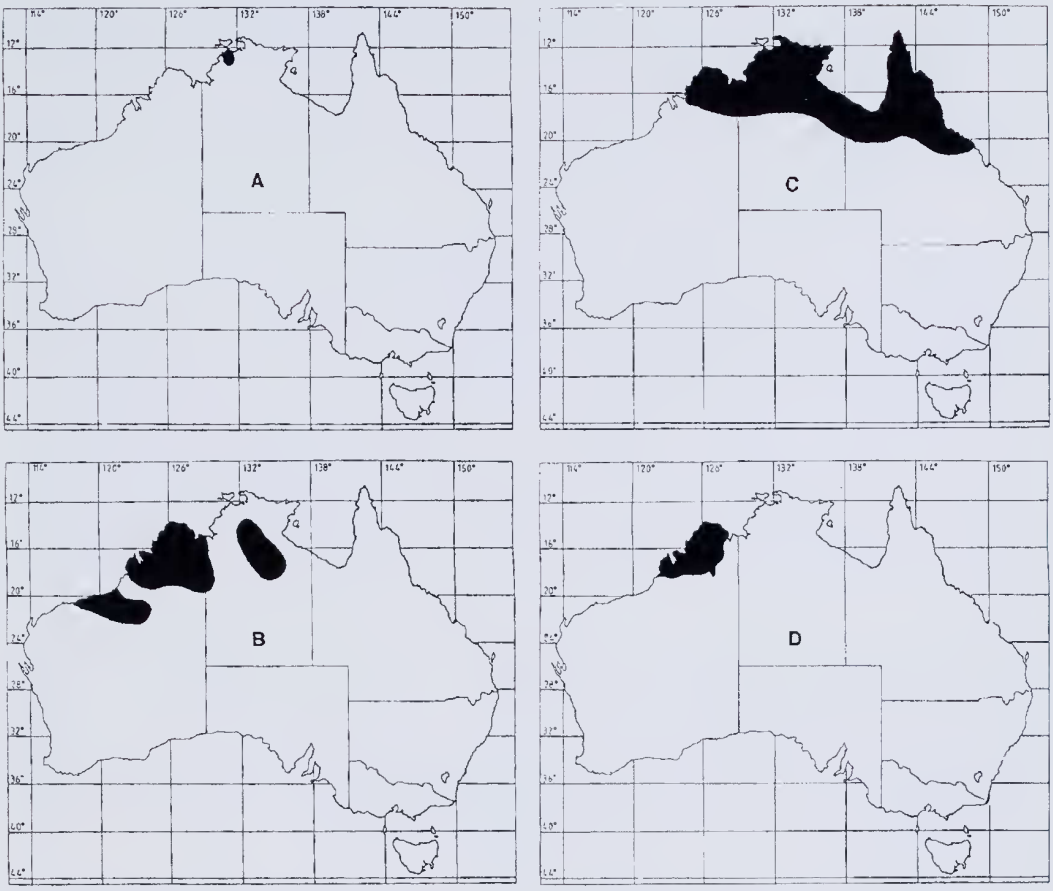

Figure 1. Generalized geographical distribution of *Byblis* in northern Australia A - *Byblis aquatica*; B - *B. filifolia*; C - *B. liniflora*; D - *B. rorida*.

Key to the species of *Byblis* in northern Australia

1 Anthers shorter than the filaments 2
1: Anthers as long as, or longer than the filaments 3
2 Plants erect, bushy; pedicels as long as or longer than the leaves; seeds 0.6-0.8 mm long, with minutely denticulate longitudinal ridges and shallow transverse ridges between ..... **B. liniflora**
2: Plants elongated, straggling or floating; pedicels as long as or shorter than the leaves; seeds 1-1.3 mm long, with smooth, prominent longitudinal ridges but no transverse ridges ..... **B. aquatica**
3 Sepals bearing glandular setae 0.7-1.5 mm long; pedicels (especially near the apex), sepal bases and apical juvenile leaf growth densely covered with sessile glands ..... **B. rorida**
3: Sepals bearing stalked glands 0.3-0.5 mm long; pedicels and apical juvenile leaf growth covered with stalked glands ..... **B. filifolia**

Byblis aquatica Lowrie & Conran, *sp. nov.*

B. liniflorae Salisb. affinis sed pedicellis folia aequantibus vel eis brevioribus, foliis secus axem majorem dispersis; axe majore in statu juvenili breviter erecto, demum supra herbas propinquis inclinatis, sed in statu maturo ad 45 cm longo supra terram effusos vel in habitationibus inundatis natanti differt.

Typus: On Redcliffe Road, *c.* 1 km north of the junction with Elizabeth Valley Road, Noonamah, Northern Territory, 12° 44' S, 131° 03' E, 28 April 1995, *A. Lowrie* 1117 (*holo:* PERTH 04658906; *iso:* DNA, MEL).

A fibrous-rooted *annual herb* with leaves scattered along an elongated major axis, up to 5 cm long and erect when juvenile, 5-15 cm long and leaning on nearby herbs when older, 15-45 cm long and straggling over the ground or floating when the habitat floods in the wet season. *Leaves* terete, tapering towards a small apical knob-like swelling, 2-4 cm (mostly 3-3.5 cm) long, greenish maroon, covered with numerous viscid, stalked insectivorous glands. *Inflorescence* of solitary axillary flowers, many-flowered but few flowers open at the same time. *Pedicels* 1.5-3 cm (mostly 2-2.5 cm) long. *Sepals* ovate, 3-4 mm long, 1.2-1.5 mm wide, glands stalked, almost glabrous. *Petals* obovate, adaxial and abaxial surface purple, 5-7 mm long, 2.5-4.5 mm wide, margins entire, apex crenate. *Stamens* 5, filaments 2-2.5 mm long, anthers 0.9-1.3 mm long. *Ovary* 0.8-1 mm long, with a few glands on the apex at anthesis. *Style* 2-2.5 mm long; stigma with numerous papillae. *Capsule* broadly obovoid, 3-4 mm long, 2.5-4 mm wide. *Seeds* 1-1.3 mm long, black, with smooth, prominent longitudinal ridges but no transverse ridges. (Figure 2)

Other specimens examined. NORTHERN TERRITORY: Howard River, 3 Apr. 1988, *A. Lowrie* 10 (PERTH); near "Dry Dump", Elrundie Road, Palmerston, 14 Apr. 1990, *A. Lowrie* 74 (PERTH); 1.6 km SE of Chung Wah Terrace, on Elrundie Road, Palmerston, 23 Apr. 1994, *A. Lowrie* 891 (PERTH); Gunn Point Road, *c.* 1 km northwards of Howard River Bridge, Howard Springs, 24 Apr. 1994, *A. Lowrie* 897 (PERTH); on Hopewell Road, 1 km from Berry Springs, 27 Apr. 1994, *A. Lowrie* 932 (PERTH); Noonamah pumping station, 7 Jan. 1991, *P. Simmons* 14 (PERTH); 17.7 km from Berry Springs along Cox Peninsular Road heading to Mandorah, 31 Mar. 1991, *P. Simmons s.n.* (PERTH).

Distribution. Byblis aquatica is distributed from Darwin to Berry Springs in the Northern Territory.

Habitat. Byblis aquatica grows in fine clayey sand in wet season-flooded depressions and on the shores of freshwater lagoons in shallow water.

Flowering period. January to May.

Conservation status. Byblis aquatica is a common species in the Northern Territory and is currently not under threat.

Etymology. The epithet, *aquatica*, is taken from the Latin, *aquaticus* - growing in water.

Affinities. In the Darwin region *Byblis aquatica* and *B. liniflora* are often found near each other, but always in different habitat niches. In the case of *B. aquatica* the habitat is always flooded to a shallow depth in the wet season, whereas *B. liniflora* is restricted to the nearby higher, well drained soils.

Byblis aquatica has the following features that differ from those of *B. liniflora*, the contrasting features of the latter being given in parentheses: flowers purple (flowers pinkish mauve); leaves greenish

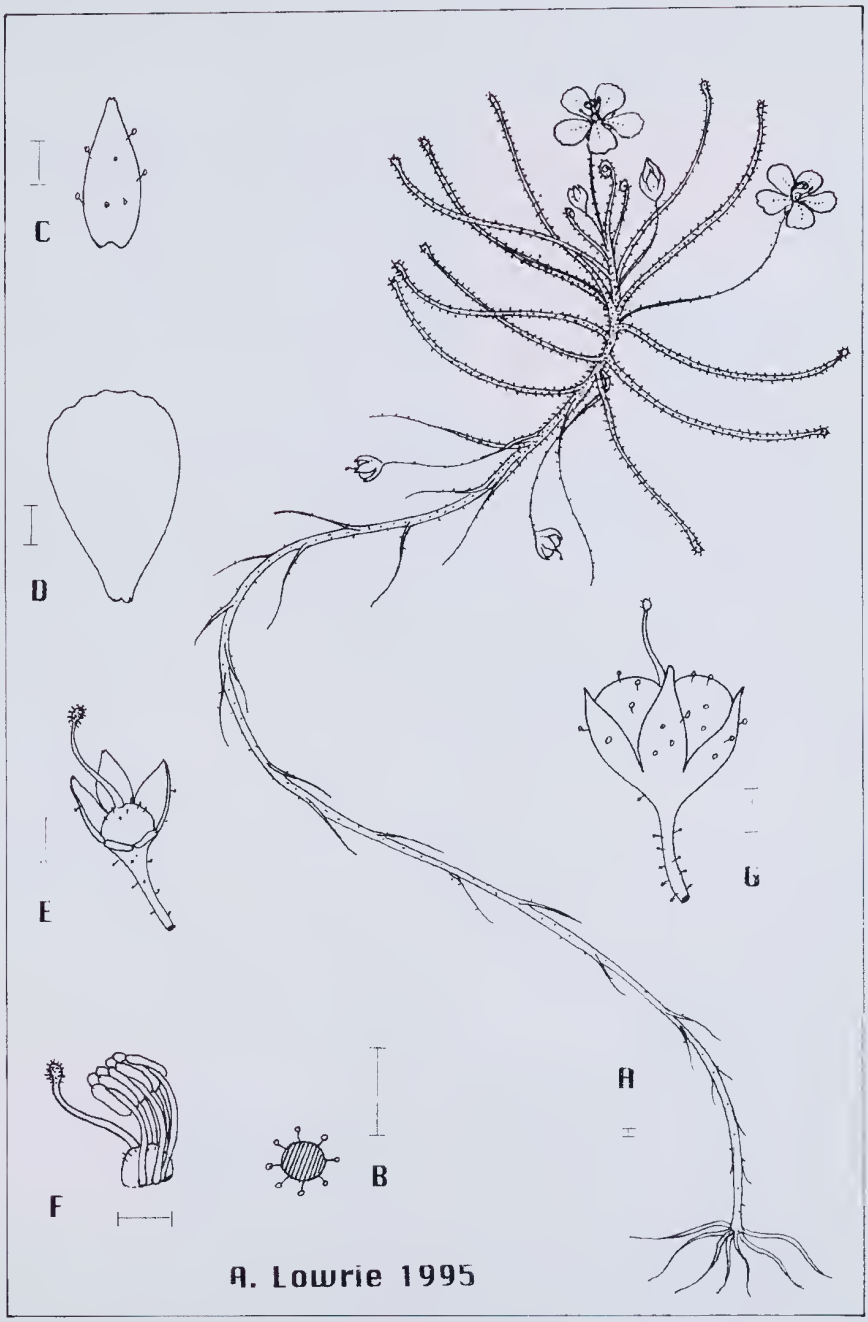

Figure 2. *Byblis aquatica* A - habit of plant in flower; B - leaf section; C - sepal; D - petal; E - gynoecium; F - stamens and gynoecium; G - seed capsule. Scale bar for all = 1 mm. Drawn from *A. Lowrie* 1117.

maroon (leaves pale green); plants in the beginning shortly erect and self-supported when juvenile up to 5 cm long, erect, but leaning on nearby herbs when older and 5-15 cm long, later straggling over the soil surface or floating when the habitat is flooded in the wet season and 15-45 cm long with the apex of the plant erect from the horizontally positioned major axis and free of the soil or water surface (plants terrestrial, bush-like).

Byblis filifolia Planch. (Planchon 1848: 305-306). *Type:* North west coast of New Holland [Australia], no date, *Bynoe s. n.* in Herb. Hook. (*lecto,* here designated: K); single specimen on shared sheet, labelled "*B. filifolia* N. W. Coast, Australia, no date, *Bynoe s.n.*" in Herb. Hook. (*isolecto:* K).

Byblis liniflora subsp. ***occidentalis*** Conran & Lowrie (Conran & Lowrie 1993: 175-179). *Type:* Vansittart Bay, unnamed creek running into Pauline Bay, mouth of creek above tidal influence, Western Australia, 22 May 1984, *S.J. Forbes* 2095 (*holo:* PERTH 01490281 (specimen on right); *iso:* PERTH (specimen on left), MEL, L).

A fibrous rooted *annual herb* with leaves scattered along a rather woody major axis, plants erect or leaning on nearby herbs for support 20-60 cm in height. *Leaves* terete, tapering towards a small apical knob-like swelling, 3-15 cm (mostly 4-8 cm) long, covered with numerous viscid, stalked insectivorous glands. *Inflorescence* of solitary axillary flowers, many-flowered, apical clusters of many open flowers are produced at the peak of anthesis. *Pedicels* 3-10 cm (mostly 4-7 cm) long. *Sepals* obcuneate or lanceolate, 4.5-6.5 mm long, 1.2-1.8 mm wide, surface and margins densely glandular. *Petals* obovate, mauve, abaxial surface white, yellow or yellow with mauve radiating stripes, 10-15 mm long, 9-10 mm wide, margins entire, apex irregularly serrate. *Stamens* 5, filaments 1-3 mm long, anthers 2.5-3.5 mm long. *Ovary* 1.2-1.5 mm long, densely glandular on the apex at anthesis. *Style* 4.5-5.5 mm long, apex with numerous papillae. *Capsule* broadly obovoid, 3.5- 4.5 mm long, 4.5-5 mm wide. *Seeds* 0.5-0.6 mm long, with denticulate longitudinal ridges and deep transverse ridges between. (Figure 3)

Other specimens examined. WESTERN AUSTRALIA: De Grey River, 1940, *N.T. Burbidge* 1006 (PERTH); *c.* 5 km W of Beverley Springs Homestead, 12 Aug. 1975, *A.S. George* 12237 (PERTH); Weaber Plains Road, 1 Apr. 1988, *A. Lowrie* 6 (PERTH); Gibb River road, Dawn Creek crossing, 18 June 1993, *A. Lowrie* 722 (PERTH); Gibb River road, Russ Creek crossing, 25 June 1993, *A. Lowrie* 771 (PERTH); 2 km N of the King Edward River crossing, Kimberley, 23 June 1994, *A. Lowrie* 970 (PERTH); 3.5 km SE of Honeymoon Beach, NW of Kalumburu, 26 June 1994, *A. Lowrie* 1006 (PERTH); Dominic Creek on the road to Pago Mission, 26 June 1994, *A. Lowrie* 1008 (PERTH); Unamon Creek on the road to Pago Mission, 26 June 1994, *A. Lowrie* 1020 (PERTH); On Gibb River-Kununurra road at Rolly's Jumpup, Durack River Station, 28 June 1994, *A. Lowrie* 1040 (PERTH); 15 km W of Kununurra, 26 Apr. 1995, *A. Lowrie* 1110 (PERTH); King Edward River crossing, Kimberley, 26 Apr. 1996, *A. Lowrie* 1399 (PERTH); *c.* 0.5 km W of Little Merten's Creek Helipad, 28 Apr. 1996, *A. Lowrie* 1410 (PERTH); 45.4 km E of Kununurra, 8 May 1996, *A. Lowrie* 1463 (PERTH); *c.* 1 km N of Taylor's lagoon, 26 June 1997, *A. Lowrie* 1698 (PERTH); 6.2 km W of Taylor's Lagoon, 26 June 1997, *A. Lowrie* 1704 (PERTH); Miangii, E side of Vansittart Bay, Kimberley, 25 Mar. 1993, *A. A. Mitchell* 2922 (PERTH); Port Hedland airport, 28 June 1969, *H. van Dam* 122 (AD, PERTH).
NORTHERN TERRITORY: Near watercourse 44 km SW of Hooker Creek settlement, 15 Apr. 1959, *G. Chippendale s.n.* (PERTH); Woolaning, 4 Apr. 1981, *C.R. Dunlop & L. Craven* 5923 (PERTH); 147 mile [235.2 km] peg, Stuart Highway, 4 Apr. 1965, *A.S. George* 6517 (PERTH); Cox River Station, 9 Aug. 1977, *T.S. Henshall* 1672 (PERTH).

Distribution. Byblis filifolia is distributed from the Port Hedland region to the Little Sandy Desert and Great Sandy Desert; throughout the Kimberley in Western Australia and adjoining regions in Northern Territory; and south-west of the Katherine region towards the Tanami Desert.

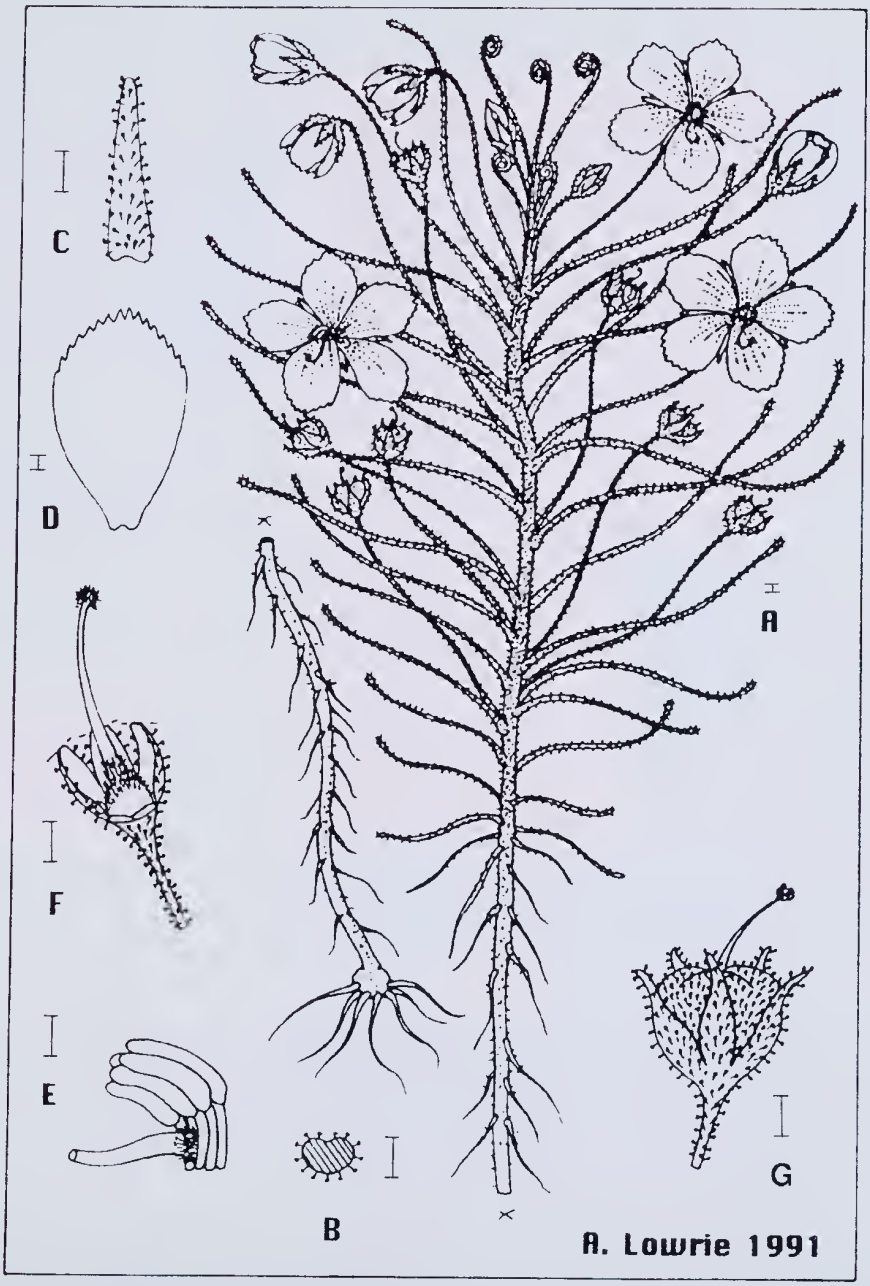

Figure 3. *Byblis filifolia* A - habit of plant in flower; B - leaf section; C - sepal; D - petal; E - stamens and gynoecium; F - gynoecium; G - seed capsule. Scale bar for all = 1 mm. Drawn from *A. Lowrie* 6.

Habitat. Byblis filifolia grows in sandy soils in savannah woodland, in sandy soils on river and creek margins, fresh water seepage areas, watersheds in sandy loam and in skeletal soils over sandstone pavements.

Flowering period. March to June.

Affinities. Byblis filifolia can be readily distinguished from *B. aquatica* and *B. liniflora* by its anthers as long as, or longer than the filaments and from *B. rorida* by having plants erect or leaning on nearby herbs for support and 20-60 cm in height; densely glandular sepals; and by the lack of sessile glands on the pedicels, sepal bases and apical juvenile leaf growth.

Conservation status. Byblis filifolia is a common species throughout the Kimberley region of northern Western Australia and not under threat.

Etymology. The epithet, *filifolia*, is taken from the Latin, *filum* - thread, and *folium* - leaf, describing the filiform leaves, especially in pressed specimens of this species (Sharr 1996).

Lectotypification. The lectotype consists of four specimens 12.9 cm tall, near the top on their own sheet. The isolectotype is a single specimen of a similar height, labelled *Byblis filifolia* from the same collection of Bynoe on a shared sheet with "*B. liniflora,* Gulf of Carpentaria (remaining hand written notes unclear)" and "*B. filifolia,* Sturt's Creek, *F. Mueller*."

Notes. Examination of the Cibachrome photographs of the type specimens of *Byblis caerulea* and *B. filifolia* indicated both taxa should be placed in synonymy under *B. liniflora* Salisb. because of their small size and stature which closely resembled both the type description and illustration for *B. liniflora* (Conran & Lowrie 1993). However, subsequent detailed examination of the type material of *B. filifolia* (including the stamens hidden by the petals in the Cibachrome photographs) provided convincing evidence that *B. filifolia* is referable to *B. liniflora* subsp. *occidentalis*. Complete stamens with anthers 3 mm long and filaments 1 mm long were observed on two of the five specimens of the Bynoe sheets. The remaining three specimens were in fruit. The key character (anthers as long as, or longer than the filaments), separates *B. filifolia* from *B. liniflora*. The *B. caerulea* type sheet copy (BM) as well as examination of specimens labelled *B. caerulea* at (K) confirmed that *B. caerulea* should remain as a synonym under *B. liniflora* Salisb.

There are also three specimens labelled *"Byblis filifolia* Pl. Sturt's Creek, *F. Mueller"* (located at the bottom of the herbarium sheet with the single Bynoe specimen of *B. filifolia* above). The stamens of these Mueller specimens also possess anthers that are longer than the filaments, similar to the *B. filifolia* Bynoe collection. No precise location details are given, but Sturt's Creek is located in the arid inland region of east Kimberley, Western Australia and the adjoining region in Northern Territory bordering the Tanami Desert.

Benjamin Bynoe was the ship's surgeon and naturalist on *H.M.S Beagle* (which on another voyage carried Charles Darwin around the world) undertaking maritime surveys for The British Hydrographic Office under the command of John Lort Stokes 1837-1843 (Hordern 1989). The five specimen collection of *Byblis filifolia* labelled "N.W. Coast, New Holland, *Bynoe*" was collected from the tropical north-west coast region of Australia, now known as the Kimberley, somewhere between Roebuck Bay and the Prince Regent River. *H.M.S. Beagle's* surveying grounds in the Kimberley were reached by sailing from the Swan River in south-west Western Australia, to which they later returned, from January to May 1838 (the wet season in northern Australia).

Exactly where Bynoe collected his specimens on the north-west coast is not recorded, however, *Byblis* is common in freshwater seepage areas, watersheds, creek and river margins throughout the Kimberley, including coastal regions. Bynoe could have collected his specimens from any of a multitude of suitable freshwater habitats (in the wet season) just above the high tide shoreline between Roebuck Bay and Prince Regent River along the north west coastal regions of the Kimberley. Additionally, he undertook many short explorations inland in the Kimberley region to hunt and collect natural history specimens.

In April 1995 *Byblis filifolia* (*A. Lowrie* 1110 PERTH) was discovered coexisting with *B. liniflora* (*A. Lowrie* 1107 PERTH) at a newly explored location 15 km west of Kununurra, Western Australia. The habitat consists of sandy loam soil covered in most parts by a film of water (at the end of the wet season) which supports a low open sedge field along with the other carnivorous plants *Utricularia chrysantha* R. Br., *Utricularia tridactyla* P. Taylor and *Drosera indica* L. Both *Byblis* taxa occurred in reasonable numbers scattered throughout the habitat, and in a few areas within this wet habitat the two species were observed growing side by side. In this area, *B. liniflora* was confined to the wetter ground; *B. filifolia* also grew on the surrounding higher, well-drained sandy soils in association with *Drosera ordensis* Lowrie.

In this habitat, the two *Byblis* taxa clearly differ from each other. Specimens of *B. filifolia* are large robust plants 20-60 cm tall, whereas specimens of *B. liniflora* are small plants 5-15 cm tall. As well as the overall size difference between both taxa, the key morphological character of *B. filifolia* bearing anthers as long as, or longer than the filaments and *B. liniflora* bearing anthers shorter than the filaments held true with all specimens examined throughout the habitat. A thorough search was made of the entire location paying particular attention to establishing if intermediate forms existed between both species. Despite extensive exploration of the habitat over two days, no intermediate forms were found. In May 1996, 45.4 km east of Kununurra *B. filifolia* (*A. Lowrie* 1463 PERTH) was again found growing with *B. liniflora* (*A. Lowrie* 1462 PERTH) in a similar habitat. At this location the two taxa maintained their distinctive maximum height differences. These two observations at widely separated locations confirm that *B. filifolia* and *B. liniflora* can coexist with each other without apparently hybridizing, providing further justification to treat both taxa as distinct entities.

In a study conducted by Meyers-Rice (1993), the failure of *Byblis filifolia* to produce seed when crossed with *B. aquatica,* indicated reproductive isolation. The author concluded that *B. aquatica* and *B. filifolia* are different species and recommended that they be formally described.

Byblis liniflora Salisb. (Salisbury & Hooker 1808: t. 95). - *Psyche liniflora* Salisb. *nom. inval.* (Salisbury & Hooker *loc. cit.*). *Type:* Illustration tab. 95 in Salisbury & Hooker (*loc. cit.*) as *Psyche liniflora.*

Byblis caerulea R. Br. ex Planch. (Planchon 1848: 306). *Type:* Australia: Endeavour River, [Queensland, 1770], *Banks & Solander s.n.* (*holo:* BM).

A fibrous rooted *annual herb* with leaves scattered along the major axis forming an erect bush-like plant 5-15 cm in height. *Leaves* terete, tapering towards a small apical knob-like swelling, 2-8 cm (mostly 3-5 cm) long, covered with numerous viscid, stalked insectivorous glands. *Inflorescence* of solitary axillary flowers, many-flowered but few flowers open at the same time. *Pedicels* 3-9 cm (mostly 4-6 cm) long. *Sepals* lanceolate, 3-3.5 mm long, 1-1.3 mm wide, surface and margins moderately glandular. *Petals* obovate, pinkish mauve, abaxial surface white, 5-8 mm long, 3-4 mm wide, margins entire, apex crenate. *Stamens* 5, filaments 2-2.5 mm long, anthers 1-1.5 mm long. *Ovary* 0.9-1.2 mm long, with a few glands

on the apex at anthesis. *Style* 2.5-3.5 mm long, apex with numerous papillae. *Capsule* broadly obovoid, 2.5-4 mm long, 4.5-6 mm wide. *Seeds* 0.6-0.8 mm long, with minutely denticulate longitudinal ridges and shallow transverse ridges between, producing honeycomb-like sculpturing. (Figure 4)

Other specimens examined. WESTERN AUSTRALIA: 15 km W of Kununurra, 26 Apr. 1995, *A. Lowrie* 1107 (PERTH); 16.1 km W of Kununurra, 18 Apr. 1996, *A. Lowrie* 1389 (PERTH); Mitchell Falls walk trail, Kimberley, 28 Apr. 1996, *A. Lowrie* 1413 (PERTH); Above Little Merten's Falls, Kimberley, 28 Apr. 1996, *A. Lowrie* 1416 (PERTH); On coast *c.* 15 km W of Mount Anderdon, Kimberley [helicopter collection], 2 May 1996, *A. Lowrie* 1432 (PERTH); Summit of Mount Trafalgar, Kimberley [helicopter collection], 2 May 1996, *A. Lowrie* 1433 (PERTH); 5.1 km E of Kununurra, 8 May 1996, *A. Lowrie* 1461 (PERTH); 45.4 km E of Kununurra, 8 May 1996, *A. Lowrie* 1462 (PERTH); Just outside Kununurra meat works, 4 Mar. 1993, *A. A. Mitchell* 2849 (PERTH, BROOME); Beverley Springs homestead, Kimberley, 19-26 May 1979, *B. G. Muir et al.* 796B (sheet 2/2 PERTH 01490249)*.
NORTHERN TERRITORY: S end of Owston Ave, Palmerston, 8 Apr. 1990, *A. Lowrie* 48 (PERTH); Near "Dry Dump" Elrundie Road, Palmerston, 14 Apr. 1990, *A. Lowrie* 75 (PERTH); Berrimah Road, 3.5 km W of Stuart Highway, Darwin, 29 Apr. 1994, *A. Lowrie* 951 (PERTH); Owston Ave, Palmerston, 9 Mar. 1991, *P. Simmons s.n.* (PERTH).
QUEENSLAND: *c.* 10 miles [16 km] N of Kennedy, 15 May 1973, *R. Nash* 1382 (PERTH); Upper Murray River turn off (N road) from Highway 1, 21 Aug. 1983, *R. Nash* 1824 (PERTH); At southern turn off to Upper Murray River, north Cardwell, on Highway 1, 21 Aug. 1983, *R. Nash* 1857 (PERTH).

Distribution. Byblis liniflora is widespread throughout the northern regions of Western Australia, Northern Territory and Queensland.

Habitat. Byblis liniflora grows in sandy soils, clayey sand and in skeletal soils over sandstone pavements.

Flowering period. March to August.

Conservation status. Byblis liniflora is a common species throughout northern Australia and not under threat.

Etymology. The epithet, *liniflora*, is taken from the Latin , *linum* - flax, and *floris* - flower (Sharr 1996).

Affinities. Byblis liniflora can be readily distinguished from *B. filifolia* and *B. rorida* by its anthers shorter than the filaments and from *B. aquatica* by its terrestrial bush-like plant habit, pinkish mauve flowers, pedicels as long or longer than the leaves and moderately glandular sepals.

Notes. The description for *Byblis liniflora* by Salisbury and the illustration by Hooker (Salisbury & Hooker 1808) were based on cultivated material from the collection at Cassiobury, in Hertfordshire. Arthur Capel, first Earl of Essex, had a noted seventeenth-century garden here which at the time was reported by Salisbury to contain some of the finest New Holland (Australian) plants in England. Cassiobury could only have been supplied with seed material of *B. liniflora* as the species is an annual. It is recorded that A. Gordon, a London nurseryman, obtained the original material of *Byblis liniflora* from the then colony of New South Wales which at the time included Queensland.

* Reassignment of a collection previously filed with *B.G. Muir et al.* 796A and cited in Conran & Lowrie (1993).

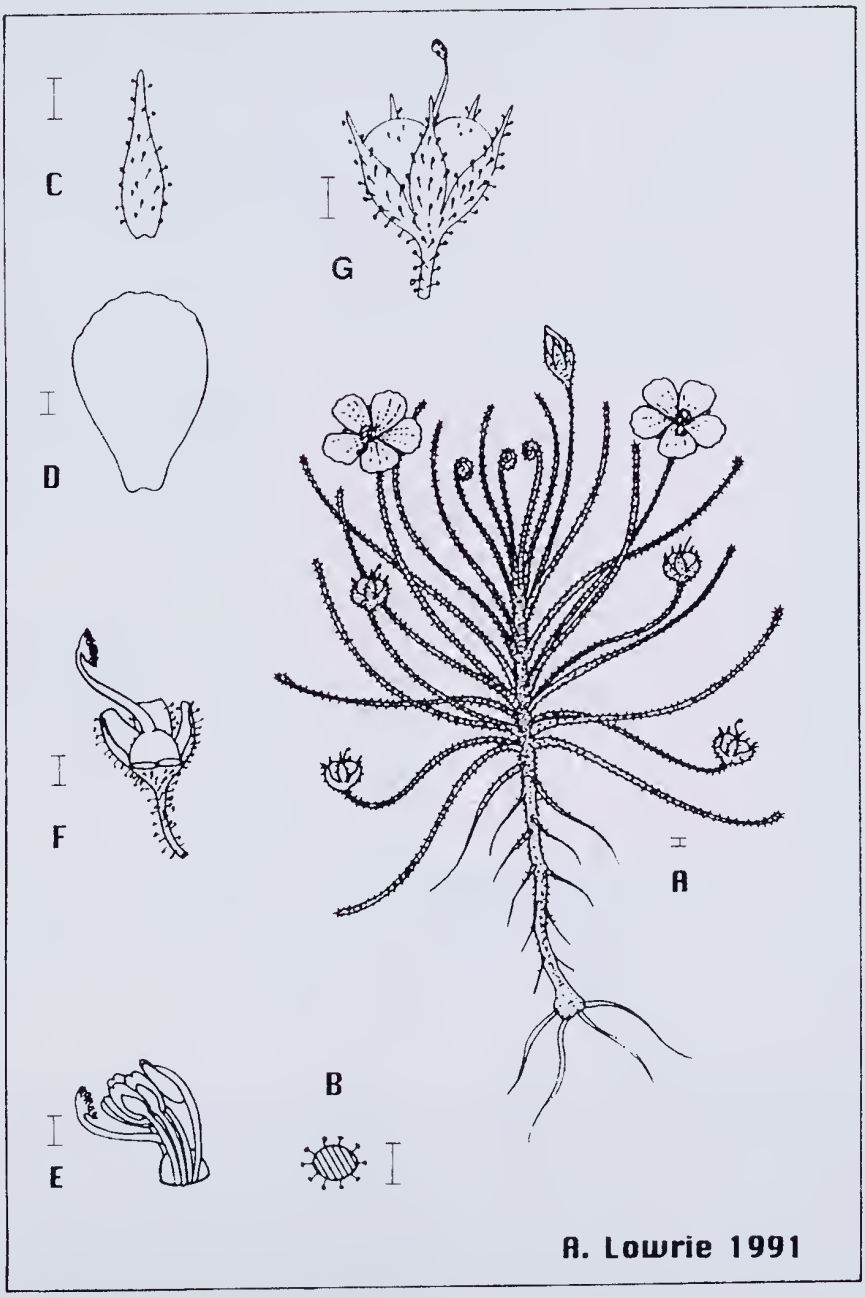

Figure 4. *Byblis liniflora* A - habit of plant in flower; B - leaf section; C - sepal; D - petal; E - stamens and gynoeeium; F - gynoecium; G - seed capsule. Scale bar for all = 1 mm. Drawn from *A. Lowrie* 75.

Although the original description of *Byblis liniflora* by Richard Anthony Salisbury recorded the common name for the species as the "Flax-flowered *Psyche*" and the accompanying illustration by William Hooker (1779-1832) the artist and pupil of Bauer (not to be confused with William Jackson Hooker (1785-1865)), is also labelled *Psyche liniflora,* the name *Psyche,* has not been taken up by other authors. Farr *et al.* (1979) listed *Psyche* as an accepted name although it is not validly published as it was not accepted by the author in its original publication (see Article 34.1 in the International Code of Botanical Nomenclature (Greuter *et al.* 1994)).

Byblis caerulea is based on Bauer's plate 113 published by Endlicher (1841) and drawn from Robert Brown specimens in which the short anthers are figured as being peltate. Planchon (1848) thought he recognized these anthers in the specimens glued down in the Banksian Herbarium [BM]. According to Bentham (1864) the specimens in Brown's own herbarium showed that this was a mistake as the anthers are often as short as figured by Bauer, sometimes as long as figured by Salisbury & Hooker (1808), but always attached by the base and varying much in intermediate lengths in different specimens.

Bentham's description of *Byblis liniflora* recorded "anthers varying from 3/4 line [1.575 mm] to 11/2 lines [3.15 mm] in length, the filaments longest where the anthers are shortest". The latter statement corresponds with the key morphological character for *B. liniflora* "anthers shorter than the filaments". However, anthers 3.15 mm long are not applicable to *B. liniflora* but do agree with *B. filifolia.* Two collections of *B. filifolia,* N.W. coast, *Bynoe* and Sturt's Creek *F. Mueller,* were cited in Bentham's *B. liniflora* treatment. Examination of these collections has revealed anthers 3 mm long, comparable to Bentham's measurements.

The type sheet of *Byblis caerulea* (BM) holds nine specimens. All specimens agree with the original description and illustration for *B. liniflora.* This collection was made on Cook's First Voyage 1768-1771 from the Endeavour River region, Queensland, Australia, by Banks and Solander, while repairs to the ship *Endeavour* were being made near the present town of Cooktown, from 17 June to 4 August 1770 (Steam 1969).

There are two herbarium sheets at Kew with early collections referable to *Byblis caerulea.* The first sheet, *R. Brown* 4836, North Coast of New Holland, 1803, has two collections, the first of six specimens and the second of two specimens labelled "Upper Victoria River, F. Mueller". The second sheet has one collection of eleven plants labelled North Coast of New Holland, 1803. All plants on both sheets match *B. liniflora.*

Byblis rorida Lowrie & Conran, *sp. nov.*

B. filifoliae Planch. affinis sed sepalis setis longis capitulis glandularibus 0.7-1.5 mm longis ornatis; pedicelis (praecipue prope apicem), sepalis ad basim, et foliis juvenilibus glandulis roscidis dense ornatis; semina cristis minute denticulatis profunde sculptis, costis humilibus reticulatis alternantibus.

Typus: 200 metres south-south-east of Beverley Springs Station homestead, Kimberley, Western Australia, 16° 43' 05" S, 125° 27' 32" E, 8 February 1996, *R.L. Barrett* 825 (*holo:* PERTH 04658892; *iso:* DNA, MEL).

A fibrous rooted *annual herb* with leaves scattered along the major axis which is erect or when taller plants leaning on nearby herbs for support, major axis 6-30 cm long with dew-like sessile glands densely covering the juvenile apical growth. *Leaves* terete, tapering towards a small apical knob-like swelling,

2-5 cm long, covered with viscid, sessile glands and stalked insectivorous glands. *Inflorescence* of solitary axillary flowers, many-flowered but few flowers open at the same time. *Pedicels* (especially near the apex) covered with dew-like sessile glands. *Sepals* lanceolate, 3.5-4.5 mm long, 1.2-1.3 mm wide, bearing long setae with glandular heads 0.7-1.5 mm long as well as dew-like sessile glands. *Petals* obovate, mauve, abaxial surface white, 6.5-10 mm long, 4-4.5 mm wide, margins entire, apex deeply dentate. *Stamens* 5, filaments 1-1.5 mm long, 3 anthers 2.5-3 mm long, remaining pair 1.5-2.5 mm long. *Ovary* 0.8-1 mm long, with many stud-like glands on the apex at anthesis. *Style* 4-4.5 mm long, apex bilobed with numerous papillae. *Capsule* broadly obovoid, 3.5-4 mm long, 4-5 mm wide. *Seeds* 0.7-0.8 mm long, black, deeply sculptured and honeycomb-like with minutely denticulate longitudinal crenulate ridges with shallow ridges between. (Figure 5)

Other specimens examined. WESTERN AUSTRALIA: Near Beverley Springs Station homestead, 13 Mar. 1993, *R.L. Barrett* 236, 12 Apr. 1995, *R.L. Barrett* 250 (PERTH); 1 km ENE of Beverley Springs Station homestead, 9 Apr. 1995, *R.L. Barrett* 617 (PERTH); 1 km NE of Beverley Springs Station homestead, Kimberley, 10 Feb. 1996, *R.L. Barrett* 839 (PERTH); Wolf Creek [meteor] Crater, *c.* 85 km S of Halls Creek, 13 July 1974, *G.W. Carr* 3582 & *A.C. Beauglehole* 47360 (PERTH)*; Mitchell Plateau mining camp, 2 Mar. 1980, *C.R. Dunlop* 5348 (BRI, CANB, DNA, PERTH)*; Yeeda, 28 miles [44.8 km] S E of Derby, Apr. 1927, *A.J. Ewart s.n.* (PERTH); Near Christmas Creek, Kimberley, May 1927, *A.J. Ewart s.n.* (PERTH); Inglis Gap, King Leopold Ranges, May 1905, *W.V. Fitzgerald s.n.* (PERTH); Above Roebuck Bay, May 1960, *C.A. Gardner* 12411/3 (PERTH)*; 11.9 km W of Inglis Gap on Derby to Gibb River road, King Leopold Range, 16 May 1988, *E.M. Goble-Garratt* 591 (PERTH)*; Great Sandy Desert, 10 km S of Jeffries Field, 4 June 1981, *W.K. Harris* 2 (AD, PERTH)*; 4 km S of Cape Bertholet, Dampierland, N of Broome, 20 Apr. 1977, *K.F. Kenneally* 6058 (PERTH)*; Elgee Cliffs Plateau, 17 km W S W of El Questro Homestead, NE Kimberley, 24 Mar. 1978, *M. Lazarides* 8701 (PERTH)*; Cockman Range, 46 km S S W of Wyndam, NE Kimberley, 16 Mar. 1978, *M. Lazarides* 8574 (PERTH); 39.7 km W of King Edward River crossing on road to Mitchell Falls, 27 Apr. 1996, *A. Lowrie* 1405 (PERTH); Broome Bird Observatory, Kimberley, 25 June 1997, *A. Lowrie* 1693 (PERTH); S side of Taylor's Lagoon, Kimberley, 26 June 1997, *A. Lowrie* 1699 (PERTH); Lake Campion, Kimberley, 10 Feb. 1995, *A. Lowrie & S. Geisen s.n.* (PERTH); *c.* 1 km N of Durack River crossing from Gibb River Road, 23 Apr. 1996, *A. Lowrie* 1394 (PERTH); 9 km SSE of Beverley Springs homestead, 19-26 May 1979, *B.G. Muir et. al.* 796 (sheet 1/2 PERTH 01490230)*; Between Derby and Inglis Gap in King Leopold Range on beef road, May 1967, *Y. Power s.n.* (PERTH)*; 11 miles [17.6 km] N of Broome, 25 May 1967, *E.M. Scrymgeour* 1930 (PERTH)*; NE slope of Mount Broome, 30 km on Millewinde road from Gibb River road, King Leopold Ranges, 20 Apr. 1988, *B.K. Simon & M. Sands* 4009 (BRI, PERTH); 12 miles [19.2 km] from Gibb River turn off and 11 miles [17.6 k] from turn off to Broome-Fitzroy Crossing, 8 Apr. 1980, *D.E. Symon* 12049 (PERTH)*; Township of Koolan Island, W Kimberley, 1 Apr. 1984, *L. Vernon* 31 (PERTH).

Distribution. Byblis rorida is known from scattered locations throughout the Kimberley in Western Australia from the Broome Dampierland region, throughout the King Leopold Range and Beverley Springs a further 300 km north east, at the Cockburn Range and adjoining El Questro to the Durack River 450 km further northwards, 170 km further north west on the Mitchell Plateau, 70 km south of Halls Creek at Wolf Creek Crater on the edge of the Tanami Desert and Koolan Island 130 km north of Derby.

Habitat. Byblis rorida grows in beige fine grain sand on the margins of Lake Campion, in red sand in *Acacia* woodland and in yellow sand beside creeks in the Broome region; in wet clayey sand and gravel high on creek banks as well as wet season-flooded sandy skeletal soils over sandstone outcrops and pavements with *Triodia pungens* in the Beverley Springs region; laterite soils on the Mitchell Plateau;

* Reassignment of specimens cited in Conran & Lowrie (1993) as *B. liniflora* subsp. *occidentalis*.

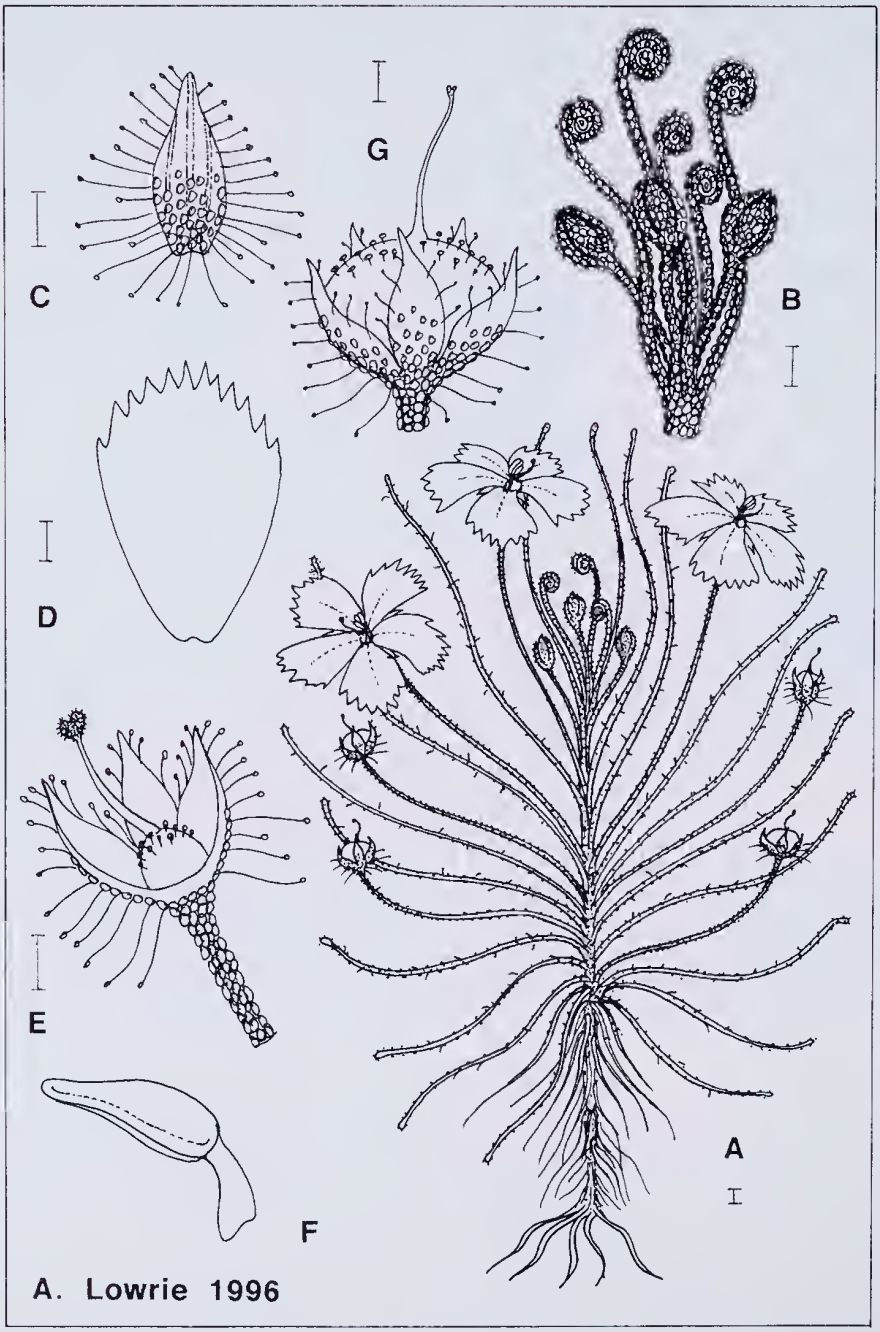

Figure 5. *Byblis rorida* A - habit of plant in flower; B - apical section of plant showing the sessile glands densely covering the juvenile leaves and flower buds; C - sepal; D - petal; E - gynoecium; F - stamen; G - seed capsule. Scale bar for all = 1 mm. Drawn from *A. Lowrie & S. Geisen s.n.* 10 Feb. 1995.

red rocky soil in the King Leopold Range; on undulating plateau in yellow-grey soils, on the crests of flatly bedded sandstone hills near El Questro Homestead; and in beige sand with cane grass (*Sorghum* species) in the Durack River region.

Flowering period. January to May.

Conservation status. Byblis rorida is known from many widespread locations in the Kimberley. It is known to be locally common in at least four of these locations and currently not under threat (A. & P. Lowrie pers. comm.).

Etymology. The epithet, *rorida*, is taken from the Latin , *roridus* - dewy, appearing as if covered with fine dewdrops, in reference to the many dew-like sessile glands on the pedicels, sepals and apical juvenile growth.

Affinities. Byblis rorida can be readily distinguished from *B. aquatica, B. filifolia* and *B. liniflora* by its sepals bearing long setae with glandular heads 0.7-1.5 mm long as well as dew-like sessile glands, pedicels (especially near the apex), sepal bases and the apical juvenile leaf growth densely covered with many dew-like sessile glands.

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